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EXAMINER

PADGETT, MARIANNE L

ART UNIT

PAPER NUMBER

1762

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/876,944

Applicant(s)

Bravo-Vasquez et al

Examiner

M.L. Padgett

Group Art Unit

1762

—The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address—

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- ☒ Responsive to communication(s) filed on 11/16/03, 6/28/02, 12/21/01, 11/16/01 & 9/7/01
- ☐ This action is **FINAL**.
- ☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 1 1; 453 O.G. 213.

Disposition of Claims

- ☒ Claim(s) 1-18 & 44-68 is/are pending in the application.
- Of the above claim(s) 68 is/are withdrawn from consideration.
- ☐ Claim(s) _____ is/are allowed.
- ☒ Claim(s) 1-18, 44-47, 49, 51-68 is/are rejected.
- ☒ Claim(s) 48, 50 is/are objected to.
- ☐ Claim(s) _____ are subject to restriction or election requirement

Application Papers

- ☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.
- ☐ The drawing(s) filed on _____ is/are objected to by the Examiner
- ☐ The specification is objected to by the Examiner.
- ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

- ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119 (a)-(d).
- ☐ All ☐ Some* ☐ None of the:
- ☐ Certified copies of the priority documents have been received.
- ☐ Certified copies of the priority documents have been received in Application No. _____
- ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a))

*Certified copies not received: _____

Attachment(s)

- ☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 4, 5, 6
- ☒ Notice of Reference(s) Cited, PTO-892
- ☐ Notice of Draftsperson's Patent Drawing Review, PTO-948
- ☐ Interview Summary, PTO-413
- ☐ Notice of Informal Patent Application, PTO-152
- ☐ Other _____

Office Action Summary

Art Unit: 1762

1. Applicant's election without traverse of group I, method claims 1-18 and 44-67, species 1 in Paper No.6 is acknowledged.

Claims 1-18 and 45-65 are directed to species 1, photo exposure, and claims 66-67 combines species 1 and 2.

2. Applicants PTO-1449 citations are made of record, except in paper #4 (11/16/01), BI, the Thesaurus by Zumer et al, was not formally supplied, since a website listing is not a permanent or immutable copy, and the 3 pages of hard copy appear to be essentially a table of contents. The EP 414,140 A2 to Asano et al was missing col. 1-8 and all figures, but cover page; EP 687186 A1 to Baum et al was missing col.1-12.

3. The disclosure is objected to because it contains an embedded hyperlink and/or other form of browser-executable code. Applicant is required to delete the embedded hyperlink and/or other form of browser-executable code. See MPEP § 608.01.

See page 9, line 19.

4. Claims 66-67 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The specification was reviewed for support for and enablement using a "particle beam" to cause a transformation into a metal-containing material, and the only related support was original claim 37 (38 as renumbered) which inaccurately said that they caused photochemical reactions

Art Unit: 1762

(electrons, ions and atoms are not light or photos, so do not cause photo-reactions, by definition), and can not supply support for “transformations..”. Page 30, lines 29-33 teaches “electron beams,...may also be used... if they are able to populate the desired excited state^es (i.e., if ... can decompose by the path of the desired photochemical reaction)” (emphasis added). So page 30, supports decomposition of the precursor metal complex to metal, which is narrower than transformation to any material that contains metal, but only if the particle beam, represented by electron beams, ion beams or atom beams, can supply an equivalent excitation to the precursor as a light source would have (ie. page 30 does not teach particle beams causes photo chemical reaction , but supplying an equal energy to cause an analogous excitation state). Note while the claim recites by-products, there is no requirement that those by-products necessarily come from the complex.

Therefore, claim 66 as amended is broader than the original disclosure, because “transformation...” encompasses broader types of reactions than the disclosed decomposition of *excited* exacted state processors, such as reactions that add to the complex without decomposing it, etc.

5. Claims 66-67 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for decomposing said metal complexes via populating the desired excited states, does not reasonably provide enablement for particle beams to cause any other type of transformation of the metal complex as is presently broadly claimed. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with these claims. .

Art Unit: 1762

See above New Matter discussion.

6. Claims 2-6, 11, 18 and 66-67 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 2 it is unclear whether or not “a photo-chemical reaction” is the same type as occurred in 1(b), since there is no clear differentiation of terms, nor use of an article showing antecedent basis. The same film is being treated (that is if it hasn’t been driven off as claimed for step c, so it no longer exists), so the reaction may be the same if the atmospheres have the same relevant gases and the second light source (electromagnetic radiation source) emits the same wavelengths as the first, but since this need not be the case, this claim is ambiguous and uncertain in meaning. Note also the “one or more ligand byproducts” are not differentiated between (b) and (d) either, nor provided with antecedence, nor is “electromagnetic radiation”. Is claim 5 indicating that 2 sources of the same UV are used or what?

Applicant should also note that supplying labels of (a), (b), (c), (d) and (e), does not necessitate any order in performing the steps, so all that is certain in claim 1-2 or in 66, is that (a) is before all other steps as the presence of the film is physically required (or claim 2 explicitly provides this limit); and that (c) or (e) must be after at least (b) or (d), in claims 1-2, but could be before one of them, making it superfluous. In claim 66, the byproducts are differentiated, but the unreacted material could still be driven off after one patterning procedure of either (b) or (d), thus

Art Unit: 1762

making the other impossible. Positive temporal and/or spacial limitations would remove this uncertainty, providing there is support for such amendments.

Claim 11 is vague and indefinite, because "an annealing temperature" is not an innate feature, and can be set at anything for the information given, so below one unknown virtually unlimited temperature, is still an unlimited temperature.

A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, in claim 17, which recites the broad recitation, and the claim also recites which is the narrower statement(see "such as " in line 3) of the range/limitation (i.e. creates a double range).

7. In claim 52, the examiner notes that applicant has included Si and Ge which are semi-metals, as metals. A review of the specification, finds that on p. 20 the disclosure is

Art Unit: 1762

ambiguous as to whether semi-metals are to be defined with metals or not, as line 23 reads "Metal M may be..." thus defining M to be a metal, but line 25 further reads "M may also be selected from the groups elements that are non-metallic, metalloid or semi-metallic, for example, silicon, germanium, gallium, arsenic and boron." While the specification could be used either way, the claims present the clear intent for Si, Ge and thus all semi-metals to be included in the claim of "metal", hence for purposes of examination metal will be considered to include all semi-metals, and metal containing to include all compounds of those elements, i.e. SiO_2 , Si_3N_4 , etc.

8. As noted in applicant's specification, dictionary definitions and art cited by applicant, a mesomorphous film includes liquid crystal materials, materials that are intermediate between solid crystalline material and liquid/amorphous material, and as in the "liquid crystallinity in Polymers..." edited by Ciferri, etc, they include micellar and lamellar materials.

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 1-4, 7, 18-44, 49, 52 and 54-67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hill et al (5,534,312) in view of Yundt.

Claims 1-16, 44 and 51-67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hill et al (5,534,312) in view of Lin.

Art Unit: 1762

Hill et al ('312) teach virtually every limitation of the claims except that their films are amorphous instead of "mesomorphous", and while teaching consecutive exposure of the same film under different atmospheres for different patterning, they do not appear to discuss multiple applications of films. There is also some different ranges of "metals" and "ligands", but the groupings mostly overlap. See the abstract; figures; summary; col. 3, lines 57-67; col. 4, lines 18-col. 7, line 30; col. 8, lines 41-col. 9, line 65 and Example for temperatures, various metals, complexes and ligand, UV, types light sources, makings by products, etc; col. 7, line 56- col. 8, line 38 for photo-reaction mechanisms, which would have been expected to be independent of phase; and col. 8, lines 14-40 for alternative to UV radiation including electron beams and ion beams.

Concerning Yundt, while he labels his deposited precursor films "amorphous", their more detailed description fits the definition of mesomorphous, as the depositions are self aligned with and attached to the substrate surface, with the other end floating free or fluidly. Yundt's precursor groups tend to form monolayers and are also described as being limited to forming isolated micelles. One recommended grouping of materials includes-siloxanes, so reads on the "metal" being Si in the metal complex. Various ligands taught by Yundt include hydroxyl, amine, carbonyl, carboxyl, acetoxyl, alkoxy, epoxy, aliphatic or other hydrocarbon groups (double or triple C-C bonds), or halogen (fluorine). See the abstract; col 2 lines 5-41+; col 3, lines 39- col. 4, lines 68, esp. lines 1-15 and 50-60; col 5, lines 35-40 and 62- col. 6, line 68, esp. 1-16 and 50-68; and col. 7, lines 2-47. While the examples mostly employ silicone material, some treat the deposits

Art Unit: 1762

thermally, and some are photosensitive layers. Examples 9-12 (col. 13) are patterning with light to cause photochemical reactions that may cause bonding sites, the deposit is stabilized or insolubilizes, where solvent may be used to remove unexposed areas. Also see claim 1. Other modification suggestions include sequentially applied layers (col. 14).

It would have been obvious to one of ordinary skill in the art, that as Yundt and Hill et al (312) are preform analogous patterning via photochemical reactions on deposited layers to produce analogous effects on overlapping ligand groups, that silicone materials as suggested by Yundt would have been expected to be effectively applied in Hill et al's process, because both may produce "metal oxide" (as in silicon oxide) connecting to the substrate via their procedures, self aligned films of Yundt have amorphous characteristics to them, while also fitting the description of "mesomorphous", hence suggesting that they will be similarly effective/effectuated as the amorphous films of Hill et al., especially as Yundt indicates that the fluid nature of the surface properties of his deposits are important to the techniques effectiveness, and this aspect is analogous to Hill et al's layers morphology.

For the alternate rejection involving Lin, this reference teaches multilayer depositions of metal organic complexes involving the metals Pb, Zr, La and Ti, as well as Cr, Fe, Nd, Eu, Pr, Mo, Yb, W, etc., where ligands include acetate, trihydrate, acetylacetonate and carbonate salts. The solutions are applied in what is referred to as a micellar process, thus are consistent with the claimed "mesomorphous" phase. Lin teaches alternative curing techniques of heating or laser patterning with a KrF 248nm laser by either masking or direct writing techniques, then rinsing the

Art Unit: 1762

substrate to remove unexposed organometallic precursors and leave a well defined metal oxide pattern. See the abstract; fig. 4; col. 2, lines 26-col.3, line 40; col. 4, lines 11-col. 5, line 20 and claims 1, 4 and 5. It would have been obvious to one of ordinary skill, given the overlapping metals, ligand, and types of radiation employed (Lin's Ex. on col. 5 actually uses lower dosage than applicants on p. 27, table), that metal complexes of Lin would have been effective alternatives to those taught by Hill et al, as they mostly overlap, differing by a phase with overlapping properties, and because the problems solved by use of Lin's solutions (col. 2, lines 1-24), such as avoiding the high temperature pyrolysis processes that often lead to cracking due to shrinkage, etc., would also have been ~~been~~ ^{be} pertinent and effective with Hill et al's procedures.

Note, while Lin does not teach Ru metal, it is homologous with Fe, which is suggested, so lacking evidence of unexpected results, hence would have been obvious due to the expectation of like (homologous) chemistry given its place in the periodic table.

11. Applicant's patent in related subject matter, P.N. 6,458,431 B2 is also made of record, with Griffith et al cited as teaching similar subject matter and complexes to 'metal' nanoparticles, but appear to use radiation mostly thermally.

Schoenfeld et al, Nakano and Neckers et al are of interest for teaching depositions of liquid crystalline layers that are photolytically pattern cured, But are directed to organic materials not complexed to metals. Sacks and the Japanese patent to Oishi are of interest for photo-chemical reactions to pattern metal complexes of interest, but the later does not discuss their layer phase, and the form is liquid.

Art Unit: 1762

While Aquino and Ibn-Elhaj cited by applicant discuss metal complexes with M-M bonds as claimed, they provide no suggestions to use them in deposition processes, nor treat them via photo-decomposition processes. Also none of the references mentioning β -diketonates, discussed mesomorphous or analogous precursor layers.


12. Claims 48 and 50 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

13. Any inquiry concerning this communication should be directed to M.L. Padgett at telephone number (703) 308-2336 on Monday-Friday from about 8:30 am-4:30 pm; and Fax # (703) 872-9310 (regular) 872-9311(after final) and 305-6078 (informal).

MLPadgett:evh

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MARIANNE PADGETT
PRIMARY EXAMINER